◆論　文

Cultural Norms and Economic Performance:

An Evolutionary Game-Theoretic Approach

Keyword Cultural norm; economic performance; evolutionary game theory; migration model; multinational enterprises (MNEs)

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1. Introduction

The aim of this paper is to provide a theoretical argument and some examples which support the hypothesis that cultural norms have a large impact on determining the society's development path. In fact, in the economic literature, some scholars regard culture, cultural norms, and social norms as crucial institutions for economic development. While some of them approach to the issue mainly from historical and descriptive analyses (Boserup 1970: Ch.1, Kuran 2003 and Platteau 2000), the theoretical study of this subject, though still in its nascency, has a growing literature (Aoki 2001, Basu 1995, Greif 1994, and Greif, Milgrom and Weingast 1994).

The theoretical study may be classified into two groups by the range of perspectives and the analytical tools employed. Greif and his collaborators analyze some particular merchant-agent relationships in pre-modern societies within a framework of the principal-agent One-Side Prisoner's Dilemma (OSPD) game. On the other hand, Aoki and Basu introduce various concepts of evolutionary game theory and suggest their applicability to development issues in the general and somewhat abstract context. In my preliminary model, I try to develop Basu's evolutionary game-theoretic approach with much emphasis on the existence of cultural norm constraints. In the part of case studies, to be more specific like Greif and his collaborators, I show some examples to support my theoretical results. In this respect, this paper may be viewed as an attempt to provide a bridge between these two types of theoretical analyses.

The rest of the paper is organized as follows. Section 2 provides a definition of cultural norms, and then argues about their effects with a special reference to their impact on the societies' development path. Section 3 presents evolutionary game-theoretic models which analyze the economic performance of societies with different cultural norms. Some interesting examples and further theoretical application are presented in section 4 to strengthen my arguments. Section 5 summarizes the findings of the paper and suggests some directions for further research.

2. Cultural Norms and Economic Development: An Overview

The main hypothesis of this paper is that, as shown in the previous section, the differences of cultural norms have a large impact on the societies' economic performance. Before formulating theoretical models, I shall address two basic and natural questions to the hypothesis. First of all, what are cultural norms anyway? Second, through which channels may the cultural norms make an impact on the societies' economic performance?

2.1 Definition of Cultural Norms

Basu (1995) defines the word "civil norms" in the context of an evolutionary game theory as follows:

> Denote Si a whole strategy set of player i, and Ti any subset of Si. A T is defined as a civil norm to which an agent of the game may adhere. Suppose an agent i adheres to a civil norm T, it means that he chooses the optimal strategy from within T and considers strategies in S minus T as ones which one ought not to use. (Basu 1995, p.25)

Thus, it may include the ones which do not originate from cultural factors (for example, it may include an environmental self-regulation recommended by an international NGO) and seems to be a broader concept than cultural norms. Although I do not take up this concept directly to analyze, I modify it to my definition of a cultural norm since it reasonably suits my evolutionary game-theoretic approach in the next section. Here I define a "cultural norm" as a cultural factor which restricts a player to choose only a subset of a whole strategy set in a game.[1] It seems fair to say that this definition of a cultural norm makes sense not only as an analytical setting but as a reflection of reality. This definition implies that a cultural norm is a sort of institutions, following the definition by Nabli and Nugent (1989).[2]

2.2 Effects of Cultural Norms on Economic Development

Can we find any analytical reasoning to the second question about the channels through which cultural norms make an impact on the societies' economic performance? Some scholars argue that the Islamic cultural norms such as (i) its conservative commercial customs (Greif (1994)), and (ii) its egalitarian inheritance system and lack of long-term enterprise activities (Kuran 2003) are apt to cause economic underdevelopment, since those norms usually prevent economic agents from choosing labor specialization and large-scale investment decisions (both physical and human capital). Likewise, Platteau (2000) regards cultural egalitarian norms in Sub-Saharan Africa as an obstacle for development since they also retard incentives of investments.

There are, however, some counterarguments: one of them is from a viewpoint of collective action theory. Collective action induced by cultural norms may conduce to economic efficiency by solving free-rider problems (Nabli and Nugent 1989, section 4) and by formulating focal point solutions that may reduce transactions costs (Schelling 1960, Ullman-Margalit 1977).

After all, the mechanisms to relate cultural norms to economic performance are complex and the net effect can be either positive (growth-enhancing) or negative

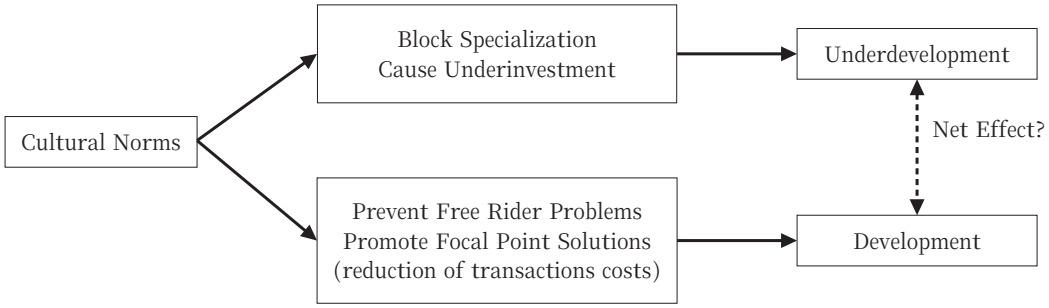

Figure 1: Channels from Cultural Norms to Development and Underdevelopment

(growth retarding). What one may say is that cultural norms do matter for economic development and we should carefully examine the mixed effects (figure 1).

3. The Model

This section presents a theoretical framework that may illustrate the relationship between economic performance of societies and their cultural norms. I employ infinitely repeated random-matching games in the context of evolutionary game theory since it is tractable to capture the societies' responses and evolution in the dynamic context.

3.1 Benchmark Random-Matching Game without Cultural Norms

First, as a benchmark case, we look at a random-matching game when there is no difference in cultural norms between societies. There are two societies (Society 1 and 2) and they are exactly identical. Both consist of "normal" members all and two of them are randomly matched within each society. There is no difference in cultural norms, and no migration. A couple of the players matched are assigned a project that needs their joint efforts. They can choose one of the three strategies, that is, {stay away, fight, cooperate}.

(i) If at least one of them stay(s) away, both of the players' payoffs will be zero, because the project needs their joint efforts.

(ii) If both of them choose to cooperate, then both will invest in the project and get a same net payoff (2, 2).

(iii) If one of them cooperates and the other fights, the fighter will defeat the cooperator and steal the money that the cooperator invests. No investment occurs. The fighter gets 2, while the cooperator suffers loss of -2.

(iv) If both of them fight, both of the players' lose a unit by the fight. No investment occurs.

Thus, the payoff matrix of this game for both societies (because they are now identical) is as in table 1. As you can readily check, there are four Nash equilibria in this game, that is, (SA, SA) = (0, 0), (F, SA) = (0, 0), (SA, F) = (0, 0) and (C, C) = (2, 2).[3] Among these equilibria, which is most likely

Table 1: Payoffs of Benchmark Random-Matching Game, For Both Society 1 and 2

		Player 2 (normal)		
		SA	F	C
Player 1 (normal)	SA	(0, 0)*	(0, 0)*	(0, 0)
	F	(0, 0)*	(-1,-1)	(2,-2)
	C	(0, 0)	(-2, 2)	(2, 2)**

Note: 1) SA: stay away. F: fight. C: cooperate.
2) * shows a Nash equilibrium.
3) ** shows a Nash and evolutionary stable strategy equilibrium (ESSE).

to be achieved in the context of this infinitely repeated and perfect-information game? Intuitively speaking, an equilibrium which is stable against small numbers of irrational behaviors (it can be, for example, either a player's mistake, or mutant invasion when I allow migration[4]). Such an equilibrium is called an "evolutionary stable strategy equilibrium (ESSE)" in the context of evolutionary game theory, though there is no space for an extended discussion on the concept of ESSE here.[5] In this particular setting, one may easily find that the socially optimal outcome (C, C) = (2, 2) is the only ESSE which is most likely to be achieved repeatedly. Since both societies are identical, both will be on the same optimal development path.

3.2 Random-Matching Game with Cultural Norms

Next, I introduce a cultural norm in this game, that is, a "collectivism and egalitarian" norm. Following Basu (1995), denote Si a whole strategy set of player i, and Ti any subset of Si. A Tc is defined as a "collectivistic and egalitarian" norm. While Si = {SA, F, C} as shown in the previous game, I define Tc = {SA, C} here. In other words, the collectivistic and egalitarian norm is an institution which constraints players not to take the hostile "fight" strategy. In addition, the norm also affects the payoff structure as we see below. Suppose now that one society consists of only the normal-type members (normal society), and the other has only the members who are constrained by the collectivistic and egalitarian norm (collectivist society). Still there is no migration.

(i) For the normal society, nothing changes from the benchmark game since there are only normal type members in the society and no migration.

(ii) For the collectivist society, the first change happens when cooperate-cooperate situation. Since all members share the collectivistic and egalitarian norm, following the reasoning in the previous section, they tend to suffer underinvestment (or are prevented from specialization) and then the payoff of the case (C, C) goes down to (1, 1). The second change is that, by definition above, members are restricted to use only the strategy of SA, or C. F is not available for both players and this choice is shadowed in matrix 2-2 (in table 2).

What are Nash equilibria in this setting? For the society 1 (normal society), as I see above, everything is same as the benchmark case. There are four Nash equilibria, and the only ESSE is (C, C) = (2, 2) which is most likely to be achieved and is socially optimal. Now, interesting features can be seen in the society 2 (collectivist society). In this

Table 2: Payoffs of Random-Matching Game with Cultural Norms

Matrix 2-1: Society 1 (Normal Society)

		P2 (NOR)		
		SA	F	C
P1 (NOR)	SA	(0, 0)*	(0, 0)*	(0, 0)
	F	(0, 0)*	(-1,-1)	(2,-2)
	C	(0, 0)	(-2, 2)	(2, 2)**

Matrix 2-2: Society 2 (Collectivist Society)

		P2 (COL)		
		SA	F	C
P1 (COL)	SA	(0, 0)*	(0, 0)	(0, 0)
	F	(0, 0)	(-1,-1)	(2,-2)
	C	(0, 0)	(-2, 2)	(1, 1)**

Note: 1) SA: stay away. F: fight. C: cooperate.
2) * shows a Nash equilibrium.
3) ** shows a Nash and ESSE.

collectivistic and egalitarian society, there are two Nash equilibria, namely, (SA, SA) = (0, 0) and (C, C) = (1, 1), and the only ESSE which is most likely to be achieved is (C, C) = (1, 1). But note that (C, C) = (1, 1) cannot be an equilibrium if the strategy of F is not restricted by the collectivistic and egalitarian norm. In other words, the collectivistic and egalitarian norm works to keep the intra-socially optimal outcome alive. One more point to note here is that (C, C) = (1, 1) is an optimal equilibrium in the collectivist society, but it is dominated by the payoff of the ESSE, (C, C) = (2, 2), in the normal society. These findings imply that the differences of cultural norms have an impact on the societies' economic performance. In this particular case, the collectivistic and egalitarian society can achieve an intra-socially optimum outcome but is inter-socially outperformed by the normal society.

3.3 Game with Cultural Norms and Migration

But there may be a question to the model with a cultural norm above. Since the two societies are isolated in the model, it seems to be just saying that it is all about the difference of the levels of investment that determine the growth path of the societies.[6] Actually, what is missing in the previous model is the possibility of migration between these two societies. Does the introduction of migration bring a different story, namely, the worldwide domination of the economically efficient system? The answer is, interestingly enough, negative in my particular setting.

Suppose that this is an infinitely repeated game and, in every period, a small proposition (say, 0.1%) of the members of each society migrate to the other one. Let me assume:

(i) The populations of the two societies are originally identical.
(ii) The migrants cannot change their cultural norm even after migration.
(iii) The resources that the migrants can bring in the new place are perishable. Thus, if they get zero or negative payoff in the period they migrate, they will die.
(iii) In this setting, in each society, there is a small possibility of type-mismatching. In the normal society, there is a small possibility (at 0.1%) that a normal member is matched with a collectivist, and vice-versa in the collectivist society. In these mismatch cases, nothing changes but the outcome of cooperate-cooperate situation. By assumption before, in case of cooperation, the levels of investment are different between normal members (high investment) and collectivists (low investment). In the case of mismatching cooperation in the normal society, the players obtain different returns, that is, $(C_{colle}, C_{norm}) = (1/2, 1)$ that reflects their different investment levels. In the case of the normal society, however, egalitarian rules work: the players are restricted to an ex-post equalization of the investment returns, even if the player's investment level is different. That is, $(C_{colle}, C_{norm}) = (3/4, 3/4)$. The whole structure of this game is shown in table 3 (including Matrix 3-1-b and 3-2-b).

In case of collectivist-collectivist and normal-normal matching (that occurs with 99.9% probability in each society), everything is same as the game in subsection b) above. What are striking are the cases of mismatching: in each case of mismatching, there are same two Nash equilibria, that is, (SA, SA) = (0, 0) and (SA, F) = (0, 0).[7] Thus, by assumption, all the migrants die after the period (since they get zero payoffs

Table 3: Payoffs of Random-Matching Game with Cultural Norms and Migration

Society 1 (Normal Society)

a) Normal v.s. Normal
>Same as Matrix 2-1

Matrix 3-1-b: Collectivist v.s. Normal

		P2 (NOR)		
		SA	F	C
P1 (COL)	SA	(0, 0)*	(0, 0)*	(0, 0)
	F	(0, 0)	(-1,-1)	(2,-2)
	C	(0, 0)	(-2, 2)	(1/2, 1)**

Society 2 (Collectivist Society)

a) Collectivist v.s. Collectivist
>Same as Matrix 2-1

Matrix 3-2-b: Collectivist v.s. Normal

		P2 (NOR)		
		SA	F	C
P1 (COL)	SA	(0, 0)*	(0, 0)*	(0, 0)
	F	(0, 0)	(-1,-1)	(2,-2)
	C	(0, 0)	(-2, 2)	(3/4,3/4)

Note: 1) SA: stay away. F: fight. C: cooperate.
2) * shows a Nash equilibrium.

at any equilibrium) and the homogeneity of the type of the society members is preserved. Of course, new 0.1% migrants are coming in the next period, but they will also die after the period. This is an example that a collectivistic norm may bring inter-socially Pareto-inferior outcomes but the norm is immune to the migration of individualistic agents. In other words, the introduction of the possibility of migration does not ensure the convergence of the pace of economic growth. In this setting, underdevelopment persists in the collectivist society.

3.4 Migration to the Third Intermediate Country

A simple but interesting extension of the model is a migration model from both of the two societies to an intermediate country which owns 50% of normal type members and 50% of collectivist members. To analyze this setting, one may necessarily introduce mixed strategy equilibrium concept. In this setting, there is a certain possibility that migrants have positive payoff, thus the population structure of the third society changes as time goes by. Intuitively speaking, normal type migrants have more chance to survive (since they have higher payoffs at equilibrium) and thus this type gradually dominates this third society. The implication of this model is, therefore, quite simple: if the third society's population is fairly mixed and if we allow the possibility of migration, the type which attains higher payoff in equilibrium may dominate majority of the population in the third society.

4. Examples, Empirical Evidence and Further Theoretical Applications

I here take up two examples to support the implications of the theoretical framework in the previous section. The first example is Greif's (1994) famous story about the competition between Maghribi (which represents Muslim society) and Genoese (which represents Latin society) merchants in the premodern era. So far as the relative efficiency of these two culturally distinct systems is concerned, Greif (1994) suggests that Genoese individualistic system may have been more efficient in the long run in the context of Mediterranean trade competition.[8] Genoese individualistic norms become finally pervasive in the Mediterranean trade network, although the fact that Muslim commercial norms still remain in some Middle Eastern regions until now may imply their evolutionary stability in some societies. This example is strongly consistent with the settings and implications of my models.

The second example is diversity of the

organizational structure of multinational enterprises (MNEs). Even under the stiff competition in the global market, organizational arrangements (labor contracts, financial structures, technology development mechanisms, and so on) of MNEs seem to be significantly different depending upon their nationalities. It is particularly interesting that Japanese MNES in the auto-related and electric goods industries, which are said to have collectivistic characteristics, have decisive competitive strength over individualistic Anglo-Saxon MNEs. Thus, the relative efficiency between collectivist and individualist organizations in this special case is contrary to the one in Greif's (1994) case above.

Let me focus on the second example which is, at a glance, difficult to understand in the context of my modeling in the previous section. Is this showing any insufficiency of my modeling? I examine this question here in two stages: first, is there really any evidence to show that Japanese MNEs are collectivistic? If the answer to this question is positive, then, may I provide a reasonable modification in my modeling to explain the diversity and relative efficiency of MNEs?

4.1 Do Japanese MNEs Have Similar Features with Greif (1994)'s Collectivistic Societies?

In the literature on the organizational structure of MNEs, there is fairly general agreement on the point that Japanese firms share certain collectivistic culture, as opposed to the individualistic culture of Anglo-Saxon firms; one of the differences in the economic literature is whether they deal with the cultural factors explicitly (Itagaki 1997) or not (Kojima 1978 and Caves 1985).

Thus, it seems reasonable to hypothesize that the behavior of Japanese companies resembles Greif's (1994) collectivist societies. Here, I would like to focus attention on an empirical investigation whether Japanese MNEs are segregated and collectivistic in the sense of Greif's (1994)'s model and have a tendency to send more directors from the headquarters to their foreign affiliates than other individualistic MNEs do. I take up a comparison of Japanese and American MNEs since they are a good reflection on collectivist and individualist societies, respectively. In addition to this, some other behavioral patters in MNEs such as (i) the differences in organizational structures and (ii) different valuation on information sharing, are briefly examined later on to confirm the validity of my arguments.

4.2 Data Source and Sample Selection and Statistical Outlook

First, to pick up American MNEs' affiliates operating in Japan (American affiliates in Japan, hereafter), I use data from the publicly available Japanese database, Kaisha Shikihou (KS, The Dictionary of Japanese Listed Companies), Fall 2011 edition, provided by Toyo-Keizai Shinpo-sha. Second, to select Japanese MNEs' affiliates operating in U.S. (Japanese affiliates in U.S., hereafter), I use data from the database, Kaigai Shinshutsu Kigyo Ichiran (KSKI, The Dictionary of Japanese Companies Operating Abroad), 2011 edition, provided by the same publisher, Toyo-Keizai Shinpo-sha. These are standard databases used by academic scholars and management professionals to analyze listed companies in Japan and their foreign affiliates. The KS covers 3,596 listed companies in Japan and the KSKI does 22,400 Japanese foreign affiliates. From these databases, I obtain cross-section data on 133 affiliates, which can be decomposed into 26

Table 4: Industrial Distribution

	J. Affiliates (in U.S.)		A. Affiliates (in Japan)	
	Number	Share (%)	Number	Share (%)
1) Auto Related	43	40.2	3	11.5
2) Chemical	12	11.2	2	7.7
3) Electrics & Electronics	15	14.0	2	7.7
4) Foods	3	2.8	1	3.8
5) Service/IT	0	0.0	7	26.9
6) Service/Others	15	14.0	9	34.6
7) Machinery	14	13.1	0	0.0
8) Metals & Ceramics	3	2.8	1	3.8
9) Others	2	1.9	1	3.8
Total	107	100.0	26	100.0

Source: (1) Japanese affiliates in U.S.: Kaigai Shinshutsu Nippon Kigyo Soran, 2011, Toyo-keizai Shinposha.
(2) American affiliates in Japan: Kaisha Shikihou, Fall 2011, Toyo-keizai Shinposha.

Table 5: Summary Statistics of the Sample Companies

	SHHQ	TPHQ	P's Share	Age	Sales	Employees
[1] J. Affiliates (in U.S.)	0.639	0.692	0.876	19.1	470	920
[2] A. Affiliates (in Japan).	0.284	0.308	0.515	16.8	2,654	5,415
Differential ([1]-[2])	0.355***	0.384***	0.361**	2.3	-2,184***	-4,495***

Source: Same as table 1.
Notes: (1) Means of top's nationality are calculated using the binary measure {If from its parent company=1, if not=0}.
(2) Sales volume: Million U.S.$.
(3) *** Significant at 1 per cent, **Significant at 5 per cent.

American affiliates in Japan and 107 Japanese affiliates in U.S.

Before turning to the regression modeling, let me show a statistical outlook of the 133 sample companies. I use the same sample in my empirical analysis later.

Table 4, indicating the industrial distribution of Japanese affiliates in U.S. (the second and third column) and Japanese affiliates in U.S. (the fourth and fifth column), vividly illustrates the different features of these two groups. The table proves that about two-fifths of Japanese affiliates in U.S. are concentrating only in the auto-related industry and 14 per cent in the electrical and electronics goods industry. On the other hand, for American ones in Japan, the share of service sector is remarkably high, more than three-fifths.

Next, table 5 summarizes the basic statistics of these sample companies. It compares the mean values of Japanese and American affiliates in terms of (i) the share of the directors who are sent from their headquarters, and (ii) whether the top of BOD, such as a chairperson, the CEO, a managing director, is sent from their headquarters (yes is counted by 1; otherwise, 0), (iii) the shareholding of parent companies, (iv) age, (v) sales turnover, and (vi) the number of employees. As the table indicates, Japanese affiliates in U.S. are, relatively speaking, owned in large proportion by the parent companies (87.6 per cent vis-*à*-vis 51.5 per cent), old (19.1 years vis-*à*-vis 16.8 years), small in sales scale (470 million U.S. dollars vis-*à*-vis 2,654 million) and employment (920 vis-*à*-vis 5,415).

More noteworthy are the differentials in their decision of managerial delegation. First, the proportion of the directors from their headquarters (SHHQ in table 2) in Japanese affiliates in U.S. is markedly lower than the one of Americans in Japan (63.9 per cent vis-*à*-vis 28.4 per cent). Second, the probabilities that the top of the directors is sent from their headquarters also differ sharply: the probability that the top of Japanese affiliates in U.S. is from their headquarters (TPQC in table 5) is higher than the one in American affiliates in Japan (62.9 per cent vis-*à*-vis 30.8 per cent). The differentials between these two groups are both statistically significant at 1 per cent level. These findings appear to support my hypothesis that Japanese MNEs have a tendency to send more (top) directors from the headquarters to their foreign affiliates than American MNEs do. However, these decisive differentials may be, at least to some extent, due to the fact that the share of parent company ownership in Japanese affiliates is higher than that of Americans. The aim of the regression analysis in the next section is, therefore, to look at the difference in managerial delegation decisions between Japanese and American MNEs, after controlling the effects of the share of parent company ownership (and other controls).

4.3 Empirical Models and Findings

The following regression models examine the hypothesis spelled out in the last section: that is, whether Japanese MNEs have a tendency to send more (top) directors from the headquarters to their foreign subsidiaries than American MNEs do. Dependent variable of model 1 and model 2 are (i) the proportion of the directors from their headquarters (SHHQ) and (ii) the probability that the top of the BOD is sent from their headquarters, respectively. I apply OLS estimation for model 1 and probit model estimation for model 2.[9] For each model, I include some control variables which may have impacts on the decision of director appointment.

[Model 1] $SHHQ = \beta_0 + \beta_1 PSH + \beta_2 SAL + \beta_3 AGE + \beta_4 JPD + \beta_5 SVD + \beta_6 ITD + \beta_7 ATD + \varepsilon$ (OLS estimation),

[Model 2] $TPHQ = \beta_0 + \beta_1 PSH + \beta_2 SAL + \beta_3 AGE + \beta_4 JPD + \beta_5 SVD + \beta_6 ITD + \beta_7 ATD + \varepsilon$ (probit model estimation).

The most crucial independent variable for my analysis is JPD, a Japanese MNE dummy variable which represents whether the firm belongs to Japanese affiliates in U.S. Among controls, the proportion of parent company's shareholding (PSH) is expected to have strong positive impacts on the dependent variables in each model. In addition to this, I chose sales turnover (SAL), age of the company (AGE), and three industry dummies (a service industry dummy (SVD), an IT industry dummy (ITD) and an auto-related industry dummy (ATD)) as controls. Age variable has a reasonable expectation to produce a negative effect (the older the company is, the more managerial delegation to indigenous talents).

4.3.1 Directors Sent from the Headquarters (SHHQ) and Japanese MNE Dummy

Column 1 and 2 of table 6 summarizes the estimation results of model 1 for all 133 Japanese and American affiliates.

First and foremost, I can find that Japanese MNE dummy has a positive and statistically significant impact on the proportion of

the directors from their headquarters. This result indicates that my main hypothesis, which says that Japanese MNEs have a tendency to send more directors from the headquarters to their foreign subsidiaries than American MNEs do, is strongly supported by evidence. The significance is robust whether the industry dummies are included (column 2) or not (column 1). If I take up the case with the industry dummies, Japanese MNE dummy brings 20 per cent higher proportion of the directors sent from their headquarters compared to American affiliates in Japan.

Second, among control variables, parent company's shareholding has a positive and statistically significant impact on the dependent variable, as was expected. Other controls, however, does not play any significant role in the regressions. Age of the company has a negative impact on the dependent variable as was expected, but the effect is not statistically significant.

4.3.2 Top of the Directors Sent from the Headquarters (TPHQ) and Japanese MNE Dummy

The results of model 2 are shown in column 3 and 4 in table 6. As I mentioned earlier, I employed probit model estimation for this model.

First, let me look at the specification without the industry dummies (column 3). In this case, Japanese MNE dummy has a positive and statistically significant impact on the probability that the top of the BOD is sent from their headquarters. Computation of marginal effect (when Japanese MNE dummy goes 0 to 1) using this specification shows that the probability that Japanese MNEs send the top of the BOD from the headquarters is 18.2 per cent higher than the one that American MNEs do. This result confirms the robustness of my main hypothesis in terms of top managerial delegation. What is interesting, however, is the result of the specification with the industry dummies (column 4). In this setting, significance of Japanese dummy disappears and then the auto industry dummy shows a strong positive correlation with the dependent variable. Judging from the fact that 26 out of 29 auto-related companies in the sample are Japanese affiliates in U.S., it seems reasonable to suppose that, among Japanese MNEs, auto-related ones are specifically conservative in the sense that they are more likely to send the top of the BOD from the headquarters.

So far as the other controls are concerned, the results are broadly similar with the ones in model 1. Parent company's shareholding has a strong positive effect on the dependent variable and the correlation is statistically significant. Sales, age, and the industry dummies, except for the auto industry dummy, are insignificant in the regressions.

4.4 An Application: MNE Penetration Game with Corporate Culture

Now I move to the second question raised at the beginning of this section: may I provide a reasonable application of my modeling to explain the diversity and relative efficiency of MNEs?

In order to examine this question, I apply the previous settings to the case of MNE penetration. I call this game "MNE penetration game with corporate culture".

Suppose that this is a repeated game and, in every period, a small proposition (say, 0.1%) of the MNEs of each country penetrate into the other one. Let me assume:

Table 6: Estimation Results

Dependent Variable	SHHQ		TPHQ	
	(1)	(2)	(3)	(4)
Estimation Method	OLS	OLS	Probit	Probit
Independent Variables:				
Parent's Shareholdings	0.484***	0.481***	1.485***	2.948***
	[0.091]	[0.098]	[0.547]	[0.741]
Sales Volume	0.000	0.000	0.000	0.000
	[0.000]	[0.000]	[0.000]	[0.000]
Age of the Company	-0.002	-0.002	-0.009	-0.005
	[0.002]	[0.002]	[0.011]	[0.011]
Japanese MNE dummy	0.186***	0.200***	0.567*	-0.526
	[0.059]	[0.073]	[0.350]	[0.467]
Service Industry Dummy		0.015		-0.114
		[0.054]		[0.325]
IT Industry Dummy		0.026		0.104
		[0.070]		[0.433]
Auto Industry Dummy		0.007		1.606***
		[0.049]		[0.406]
Constant	0.069	0.050	-1.058***	-1.901***
	[0.072]	[0.087]	[0.442]	[0.591]
Adjusted R Squared	0.377	0.363	0.121	0.247
Number of Observations	133	133	133	133

Notes: (1) Standard errors in parentheses.
(2) ***1% significant, **5% significant, *10% significant

Table 7: Payoffs of MNE Penetration Game with Corporate Culture

Matrix 7-1: I-MNE in C-Country

		P2 (I-MNEs)		
		SA	F	C
P1 (COL)	SA	(0, 0)*	(0, 0)*	(0, 0)
	F	(0, 0)*	(-1,-1)	(2,-2)
	C	(0, 0)	(-2, 2)	(1/2,1)

Matrix 7-2: C-MNE in I-Country

		P2 (C-MNEs)		
		SA	F	C
P1 (C-MNEs)	SA	(0, 0)*	(0, 0)	(0, 0)
	F	(0, 0)	(-1,-1)	(2,-2)
	C	(0, 0)	(-2, 2)	(1, 1)**

Note: 1) SA: stay away. F: fight. C: cooperate.
2) * shows a Nash equilibrium.
3) ** shows a Nash and ESSE.

(i) MNEs have their own corporate culture. The MNEs originating from a collectivist country (C-MNEs) share "collectivist culture". On the other hand, the MNEs from an individualist country (I-MNEs) share "individualist culture". The MNEs cannot change their corporate culture even after penetrating into the other country.

(ii) The resources that the MNEs can bring in the new place are perishable. Thus, if they get zero or negative payoff in the period they penetrate, they will die.

(iii) C-MNEs always bring their business partner from their origin country. In other words, C-MNEs do not play random-matching game when they penetrate into the individualist country). On the other hand, I-MNEs play random-matching game when they penetrate into the collectivist country.[10]

(iv) The whole structure of this game is shown in table 7. For the case of I-MNEs' penetration into the collectivist country, the outcome is quite similar with one of the

mismatch case in the previous migration game. Nothing changes but the outcome of cooperate-cooperate situation. In case of cooperation, the levels of investment are different between I-MNEs (high investment) and their collectivist partner (low investment). Thus, the players obtain different returns, that is, (Ccolle, Cind) = (1/2, 1) that reflects their different investment levels. This is because, in the context of modern MNEs' foreign investments, it seems to be unreasonable to assume that egalitarian profit-sharing rules work between partners even in the collectivist country. This is a typical case of Prisoner's Dilemma which leads to two Nash equilibria, that is, (SA, SA) = (0, 0) and (SA, F) = (0, 0). Thus, by assumption, I-MNEs penetrating into the collectivist county cannot survive.

(v) On the contrary, C-MNEs which penetrate into the individualist country bring their partner from their origin country. Thus, for this case, there are two Nash equilibria, namely, (SA, SA) = (0, 0) and (C, C) = (1, 1), and the only ESSE which is most likely to be achieved is (C, C) = (1, 1). C-MNEs in the individualist country survive and can keep their operation in the next period.

(vi) In the context of this MNE penetration game, collectivist MNEs retain the edges to globalize their activities while the individualist MNEs have no opportunity to keep their operation abroad. This specification is ad-hoc but still informative to illustrate that relative efficiency between collectivist and individualist organizations are, after all, case-dependent.

5. Summary and Some Future Directions for Research

This paper is an attempt to provide a theoretic framework to explain the relationship between cultural norms and the societies' economic performance. Let me now summarize the findings of this paper as follows.

(i) The mechanisms to relate cultural norms to economic performance are complex and the net effect can be either positive or negative. What I can say is that cultural norms do matter for economic development and the mixed effects should be carefully examined.

(ii) A collectivistic and egalitarian norm may work to keep a specific society's socially optimal outcome alive. In a particular case, the collectivistic and egalitarian society can achieve an intra-socially optimum outcome but is inter-socially outperformed by the normal society.

(iii) Interestingly, introducing migration in the model does not bring any difference in the results above in a particular setting. In other words, the possibility of migration does not ensure the convergence of the pace of economic growth. Underdevelopment may persist in the collectivist society.

(iv) Greif (1994) suggests that Genoese individualistic system may have been more efficient in the long run in the context of Mediterranean trade competition and this example is strongly consistent with the settings and implications of my models.

(v) It is interesting that Japanese MNES in the auto-related and electric goods industries, which are said to have collectivistic culture, have decisive competitive strength over individualistic Anglo-Saxon MNEs. The relative efficiency between

collectivist and individualist systems in this special case seems to be contrary to the one that Greif (1994) suggested in the case of Mediterranean trade competition. MNE penetration game implies that the collectivist MNEs may retain the edge to globalize their activities while the individualist MNEs have no chance to keep their operation abroad.

Since my discussion in the present paper focuses on the tip of the iceberg of this subject, it may be fruitful to suggest a line of research which will yield rich dividends in the future. The first issue is theoretical. In this paper, I employed a stationary view of cultural norms in the models for analytical simplicity. However, as Basu (1995, p.32) suggests, "norms do change and undergo mutations" after all. In fact, evolutionary game theory is intrinsically well-suited to examining such the dynamics of institutional changes. To capture the dynamic changes in cultural norms and analyze the impact on the process of economic development in the context of evolutionary game theory is an interesting extension.

The second one is empirical. To test my hypothesis that cultural norms are a crucial determinant of economic development, the simplest empirical setting seems to be employing various "culture" dummies in the regression. Cultural factors, however, may have indirect effects on growth by executing impacts on the policy factors that correlate with growth. In this respect, Easterly and Levine's (1997) work, though in somewhat different context, shows some methodological benchmark.

Last but not least, I would like to mention about the relative efficiency of the two distinct economic systems, namely, collectivistic and individual societies. In my specification, relative efficiency and growth performance between the different economic organizations is path-dependent and case-dependent. Although my specification here is ad-hoc, the conclusion is consistent with the arguments claimed by Aoki (1988, 2001) and Greif (1994). The challenge left out is to generalize the conditions under which collectivistic organizations retain efficiency edges and under which individualist organizations do. This is an important (although too involved to treat here in detail) subject and I leave an extension of my interest to this direction for my future research topic.

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Notes

1 This definition, then, naturally raises a question to the definition of "culture" and "cultural factors", but I leave this issue untouched since it is too involved a subject to be treated here in detail.
2 They define an institution as "a set of constraints which governs the behavioral relations among individuals or groups" (Nabli and Nugent 1989, p.1335).
3 For analytical simplicity, I restrict the equilibrium concept only to pure strategy equilibria and ignore the possibilities of mixed strategy equilibria.
4 In this sense, I implicitly assume the bounded rationality of the game's players.
5 For a formal definition of the ESSE, see Basu (1995), pp.23-24.
6 Tomoya Matsumoto kindly pointed out this question and helped develop a migration model.
7 There is no ESSE in this case.
8 Here I implicitly assume that the word, "normal" society, in the previous games can be replaced by "individualistic" society.
9 I also tried logit model estimation and OLS estimation for model 2, but the results remain qualitatively the same.
10 Recall the statistical fact that Japanese MNEs' mean ownership in their American affiliates is decisively higher than the American MNEs' mean ownership in their Japanese affiliates (87.6 per cent and 51.5 per cent, respectively).